REMARKS

Claim Rejections 35 U.S.C. § 112, second paragraph

The Examiner has rejected claims 31-54 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. In the opinion of the Examiner, the term "as thin as possible" in claim 31 is a relative term that renders the claim indefinite.

Applicant has canceled claim 44 without prejudice.

Applicant has amended claim 31 and claim 40 of Applicant's claimed invention to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Claims 32-39 are dependent upon claim 31. Claims 41-43, 45-54 are dependent upon claim 40. Applicant believes that these claims are also definite for being dependent upon definite claims.

In view of the foregoing, Applicant respectfully requests the Examiner to withdraw the rejections to claims 31–43, 45-54 under 35 U.S.C. §112, second paragraph.

Claim Rejections 35 U.S.C. § 103 (a)

Claims 31-35 and 37-54

The Examiner has rejected claims 31-35 and 37-54 under 35 U.S.C. §103 (a) as being unpatentable over Efland et al. (US 6,025,275) in view of Byrne (US 5,136,364).

Applicant has canceled claim 44 without prejudice.

Applicant respectfully disagrees with the Examiner. It is Applicant's understanding that the cited references of Efland et al. and Byrne, individually or collectively, fail to teach or render obvious Applicant's invention as claimed in claims 31-35, 37-43, 45-54. Applicant teaches and claims a method of fabricating a device which has low bond pad-to-adjacent metal member capacitance and which provides a hermetic seal of the substrate.

Applicant's claimed invention teaches a method to keep capacitance low in a device by forming a first material (310) over a bond pad (304) and a first member (306), where the first material (310) has a low dielectric constant and has at least a minimum thickness that is sufficient to completely fill a gap (308) between the bond pad (304) and the first member (306). See Figure 3g. Also, see lines 16-17 on page 9 of the specification. The gap (308) between the bond pad (304) and the first member (306) is completely filled with the low dielectric constant material (310) so as to obtain low capacitive coupling between the bond pad (304) and the first member (306). The result is improved (faster) device performance. See lines 7-10 on page 8 of the specification.

Applicant further forms a second material (312) over the first material (310). See figure 3g. The second material (312), which is thin and resistant to moisture penetration, is kept out of the gap (308) between the bond pad (304) and the first member (306) so that the capacitive coupling between the bond pad (304) and the first member (306) will not be increased. See lines 20-22 on page 10 of the specification. Also, see lines 24-25 on page 10 and lines 1-2 on page 11 of the specification.

The cited reference of Efland et al. teaches the filling of a gap between a bond pad (20) and a first member (20) with a dielectric layer (22) composed of an oxide (first material) and a nitride (second material). See Figure 1A. Also, see lines 42-45 in Col. 3. Efland et al. fails to teach that the nitride, which has a high dielectric constant, should be kept out of the gap in order to avoid increasing capacitive coupling between the bond pad (20) and the first member (20).

The cited reference of Byrne teaches the forming of an opening through a first material (12) to expose a top surface of a bond pad (11), the forming of a second material (18) over the first material (12) and the exposed top surface of the bond pad (11), and the forming of an opening through the second material (18). Thus, Byrne teaches a "wraparound effect" which results in an opening with sidewalls that only include the edges of the second material (18), which is nitride, and that do not include the edges of the first material (12). See Figure 4. Also, see lines 30-34 in Col. 2 and lines 1-3 in Col. 3.

The Examiner has not shown any reason, suggestion, or motivation in the cited references to combine the teachings. The first cited reference of Efland et al. teaches that bonding directly to thick plated interconnects, such as Copper, would enhance the performance of integrated circuits by eliminating the high parasitic series resistance associated with bond pads and standard multi-level VLSI metal systems. See lines 25-26 and lines 31-34 in Col. 1. No mention is made of reducing capacitance at all between the metal lines.

Efland et al. further teaches the use of a dielectric layer (22), composed of oxide and nitride, to isolate the initial semiconductor structure (10) from subsequent integrated circuit processing. See Figure 1A and lines 40-42 in Col. 3. However, no mention is made of preventing moisture penetration into the device.

The second cited reference of Byrne teaches a hermetic packaging, but is otherwise only concerned with a three-metal layer sequence: aluminum (14) for initial adherence to an aluminum bonding pad (11), a barrier metal layer (15) for isolation of the aluminum from the noble metal, and a noble metal (16), such as Gold, for corrosion resistance and electrical contact. See Figure 4 and lines 35-46 in Col. 2. No mention is made of reducing capacitance between metal lines.

Consequently, Applicant submits that the two references cited by the Examiner do not, individually or collectively, teach, suggest, or render obvious the invention as claimed by the Applicant. Instead, the Examiner has impermissibly used hindsight and the teachings of the present invention in forming his rejection.

Claim 36

The Examiner has rejected claim 36 under 35 U.S.C. §103 (a) as being unpatentable over Efland et al. (US 6,025,275) and Byrne (US 5,136,364) as applied to claims 31-35, 37-54 above, and further in view of Lou (US 5,759,906).

In the opinion of the Examiner, it would have been obvious to a person of ordinary skill in the art to modify the process of Efland et al. to include a layer comprising fluorine atoms as taught by Lou. See lines 65-67 in Col. 1.

Applicant respectfully disagrees with the Examiner. In Applicant's claimed invention, the gap between the bond pad and nearby metal interconnect is completely filled with a first material doped with fluorine atoms so as to obtain low capacitive coupling between the bond pad and the nearby metal, which results in improved and faster device performance. See lines 7-10 on page 8 of the specification.

In contrast, the fluorine-containing layer (23) of Lou is shown as being above the bond pad (16), instead of being between the bond pad and nearby metal interconnect as in Applicant's claimed invention. See Figure 7. Also, see lines 56-58 in Col. 6.

Combination of the method of Efland et al. and the method of Byrne (see discussion in previous section) with the method of Lou will not produce the method claimed in claim 36 of Applicant's claimed invention. Consequently, Applicant submits that the three references cited by the Examiner do not, individually or collectively, teach, suggest, or render obvious the invention as claimed by the Applicant. Reconstruction of Applicant's invention only with the benefit of hindsight is insufficient to present a prima facie case of obviousness.

Conclusion

In view of the foregoing, Applicant respectfully requests the Examiner to withdraw the rejections to claims 31–43, 45-54 under 35 U.S.C. §103 (a).

Applicant believes that all claims pending are now in condition for allowance so such action is earnestly solicited at the earliest possible date.

VERSION WITH MARKINGS TO SHOW CHANGES MADE

31. (Once Amended) A method comprising:

providing a substrate;

forming a metal layer over said substrate, said metal layer comprising a bond pad and a first member, said bond pad and said first member being separated by a gap;

forming a first material over said bond pad and over said first member, said first material having a low dielectric constant, said first material having at least a minimum thickness that is sufficient to completely fill said gap;

forming a second material over said first material, said second material being [as] thin [as possible while still preventing] and resistant to moisture penetration, said second material being kept out of said gap;

forming an opening through said second material and said first material to expose a top surface of said bond pad, said opening having sidewalls comprising edges of said second material and said first material;

forming a third material over said second material, said sidewalls of said opening, and said top surface of said bond pad, said third material being conductive, said third material having a thickness sufficient to prevent moisture penetration; and

forming a contact over said opening.

40. (Once Amended) A method comprising:

providing a substrate;

forming a metal layer over said substrate, said metal layer comprising a bond pad and a first member, said bond pad and said first member being separated by a gap;

forming a first material over said bond pad and over said first member, said first material having a low dielectric constant, said first material having at least a minimum thickness that is sufficient to completely fill said gap;

forming a second material over said first material, said second material being [as] thin [as possible while still preventing] and resistant to moisture penetration, said second material being kept out of said gap;

forming a third material over said second material, said third material providing stress relief between said substrate and a package, said third material providing scratch protection for said second material;

forming an opening through said third material, said second material, and said first material, to expose a top surface of said bond pad, said opening having sidewalls comprising edges of said third material, said second material, and said first material, said sidewalls being tapered in said third material;

forming a fourth material over said third material, said sidewalls of said opening, and said top surface of said bond pad, said fourth material being conductive, said fourth material having a thickness sufficient to prevent moisture penetration; and

forming a contact over said opening.

45. (Once Amended) The method of claim 40 [44] wherein said tapered sidewalls enhance subsequent film deposition.